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# The Domestication of Water: Filtering Nature Through Technology

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# The Domestication of Water: Filtering Nature Through Technology

**Abstract**

This paper examines some of the key ways in which water is mediated by technology and human artifacts. I show how the modes in which we conceive and experience this vital fluid are affected deeply by the techniques and instruments we use to interact with it. I argue that a notion of the domestication of water enables us to better grasp our relations with the environment given that vast volumes of water are now neither completely natural nor artificial in the conventional senses of the terms. Instead, water is often filtered through an expansive technological network that not merely changes its flows and phenomenal forms but greatly alters or multiplies its meanings. As examples of this process, I investigate the practical engagement with water by the first Western philosopher; the construction of several large hydrological projects; efforts at river management in the aesthetic landscape; and the emergence of bottled water.

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$H_2O$ and water have become opposites. —Ivan Illich

We'll never know the worth of water 'til the well goes dry. —Scottish proverb

The society which scorns excellence in plumbing because plumbing is a humble activity, and tolerates shoddiness in philosophy because philosophy is an exalted activity, will have neither good plumbing nor good philosophy. Neither its pipes nor its theories will hold water.
— John Gardner

## I. Introduction: Plumbing Philosophy.

Water is often conceived of as a pure unmediated presence, independent for the most part of human transformation and highly resistant to technical modification because of its unpredictable movement, deceptive strength, wide availability, or chemical structure. This paper examines several of the myriad ways in which water is mediated through technology so that our encounters and experiences with this very transparent medium and essential substance are altered profoundly by the selected means, techniques and instruments. As illustrations of this process, I initially explore the very practical engagement with water by the first Western philosopher, Thales. I proceed to discuss the philosophical and environmental effects of significant hydrological projects, efforts at river redirection, and the recent appearance of bottled water. I consider as well attempts by figures such as Martin Heidegger and Frank Lloyd Wright to respond to water's elusive properties and powers. Along the way, I show how water is revealed, concealed or transfigured through, first, physical and metaphysical construction (in the case of Thales);

secondly, aesthetic preferences and technologies of the landscape (such as de-meandering and re-meandering of streams); thirdly, waterways and waterworks (which function as a kind of social and cultural channeling); and fourthly, practices of purification (which serve as a filtering form of mediation in the instance of bottled water).

I also develop and defend the notion and practice of domestication more generally as a process that captures, interiorizes and changes formerly unbridled fluids. I argue that the domestication of water, as I term it, helps us to better understand our relations with technology and the environment because an enormous abundance of water that we now consume and contemplate is neither entirely artificial nor thoroughly natural in the traditional senses. Rather, water is frequently filtered through a vast technological nexus that not only redirects its force and flow but changes or multiplies its meanings. In the process, it is domesticated rather than dominated or released into an unadulterated presence. What are the philosophical, practical and policy implications of such enterprises? Should —or even can—we preserve water in a pristine state? Do we need to commodify or technologize it further in order to protect it and sustain us? What does the technological management of water reveal about contested issues such as pollution, wilderness preservation and landscape restoration? In order to address adequately these issues, it is helpful first to reflect upon some of the philosophical aspects of our relation with water and some of the technological dimensions of water use, especially their points of confluence.

**II. Thales' Meta/physical Watershed: Philosophy's First Practice.**

The role that humans have played in the social construction or "constrained constructivism"[1] of water and the natural world more generally is evident from the outset of Western philosophy. The classic image of the Presocratic thinker Thales is that he was the first of the Ionian *physiologoi* (natural philosophers) who speculated disinterestedly upon the world's origin, finding water to be the source of all things, the *point de repère* for the differentiation of matter. Overcoming *mythos* (myth) through *logos* (reason) and scientific observation—so the story goes—Thales was able to discern an underlying unity to all reality in the "substance" of water, the "stuff" that takes on or transforms itself into all the other states—what we now identify as the liquid, gaseous and solid—the gamut of material possibility. What Thales may have believed in short was that moisture appears to inhabit all living things and that the world seems to originate in some sense from water—possibly out of the seas. As Nietzsche puts it, Thales' proclamation rose to the level of philosophical insight for three reasons: "First, because it tells something about the primal origin of all things; second, because it does so in a language devoid of image or fable, and finally, because contained in it, if only embryonically, is the thought, 'all things are one.'"[2]

An anecdote about Thales' redirection of a river for King Croesus' army is not given wide credence[3]—it was rejected by Herodotus who tended to support and recount most stories he heard[4]—although it is commonly repeated that Thales fell into a well while star-gazing, thereby becoming a prototype for the absent-minded professor. Thus we find an image of Thales and concomitantly of the philosopher as an individual given to withdrawal into the self because of the necessity of or preference for disengagement from practical affairs and worldly matters. There is strong reason to believe, however, that Thales was involved directly and deeply with water in many of its modalities through technical work as a geometer (earth-measurer), a hydraulic engineer (water-worker) and a traveler (sea-farer) as well as a philosopher. As a result of his interactions

with and investigations of water, he may have been permitted and privileged to “discover” some of its seemingly universal qualities, properties and powers.[5] In fact, it is likely that Thales actually was able to divert the Halys River (now the Kazil Irmak) in Anatolia (modern Turkey)—about 760 miles in length—so as to make it fordable for Croesus to pass into Cappadocia on his expedition and military campaign. Historian Mott Greene describes a manner in which the feat might have been accomplished:

> He found the dried-out channel of an oxbow lake. He moved the army within its radius. He had the army cut away at the silted-in entrances -- first downward and then upstream. The river divided its flow and became fordable in both its parts . . . One could divide the flow without having to dig a channel the full width of the existing river course . . . The channel was already there, as were the natural cofferdams (the silt plugs at the ends of the oxbow), which needed only (though the engineering was not trivial) to be cut away.[6]

In other words, there may have been a *physical* “construction” project with elemental waters that helped to provide the insights into the more *metaphysical* workings of the liquid, which was in turn characterized through and marked by such practical and technical experiences. As Greene has observed, Thales “experienced water as a means of transportation, as a source of wealth (he knew to corner all the olive presses because it had rained a lot), and as an elemental substance capable of a variety of forms.” He adds that “as a resident of a hydraulic civilization, nothing could be less strange than that he developed his skills and his ideas on the basis of water.”[7] Moreover, the city of Miletus, where Thales lived, lay only 400 miles from the western delta of the Nile (a three to four day trip by boat), and it was a port through which the Meander River flowed.[8] Like Egyptian society—which Thales knew by speculating on the causes of the Nile flooding—it was oriented culturally by the dangers and commercial possibilities of powerful bodies of water and was also the training center for engineers of the Persian army.

Ancient engineer-philosophers such as Archimedes, Ptolemy and Hero also put water to practical work, helping to found in the process what is now called hydrostatics. After Aristotle’s death, the center of Greek thought moved from Athens to Alexandria, which lay at the mouth of the Nile. Around this same time, philosophy increasingly acquires a more practical orientation. Hero, for example, developed a kind of slot machine for delivering “holy water” in temples and realized that the evaporation of water can be employed to perform work as vapor expands. In other words, he was able to foresee and use the power of steam. The philosopher-poet Empedocles also provided the rudiments of an early water clock, the *klepsydra*, which is a cone-shaped vessel with holes in the base and apex that sinks slowly as it fills with water—the time taken to sink remains the same and provides a unit of measurement.[9]

Indeed, the first three millennia of recorded history were marked by an extremely active involvement with water, especially the building of dikes, dams and bridges, the prediction of seasonal climate changes and floods, the creation of irrigation systems and leveling of fields to receive water, and the building of vessels to sail the seas, lakes and rivers. Nearly all ancient civilizations established themselves in river valleys and undertook water projects and forms of river management: the Mesopotamian along the Tigris and Euphrates; the Egyptians along the Nile; the Chinese along the Yellow and Yangste Rivers; and the Harappan along the banks of the Indus, to name several of the most important.

In this regard, the Frankfurt school theorist, Karl Wittfogel, has argued that civilization itself arose through massive feats of hydraulic engineering and the need to coordinate large pools of labor as well as the centralized bureaucracies governing such waterworks. In these huge projects, water flows were interrupted, altered or re-channeled for irrigation in areas as diverse as ancient Egypt, Mesopotamia, China and India.[10] When this theory and these points are taken into account along with the centrality of water to early cultures and indeed all life—Thales dies ironically of heat and thirst—we may begin to see how the world might in some sense be seen through the transparent "element" of water. We can also witness how this very malleable matrix and medium in turn might be viewed and shaped through the lens—and partially constituted through the associated language—of laboring practices, physical construction, and psychological projections of the developing world.

**III. The Art of Watercraft: Landscape Aesthetics.**

Historian David Nye has identified what he terms "technologies of the landscape," taking as his point of departure John B. Jackson's definition of landscape as "a composition of man-made or man-modified spaces to serve as infrastructure or background for our collective existence."[11] Following this lead, we may reasonably see landscape as being as much cultural as it is strictly natural and hence inseparable from the technologies humans use to sculpt earth and channel water. In other words, technology should be viewed as integral to rather than alien from landscapes, including what we might call "waterscapes". Stated even more forcefully—and perhaps too strongly—by historian Simon Schama: "Landscapes are culture before they are nature; constructs of the imagination projected onto wood, water and rock."[12] The Netherlands, for example, is able to exist only through a complex technical system of canals, dikes, and pumping stations. It is as much a combined elemental "waterwork" and "earthwork" as it is a sovereign country in the European Community. Dutch engineers, in fact, have so altered the course of rivers and streams that it is hard to tell what originates with humans and what is the result of the forces of unbridled or undirected water. Californians, too, have spent billions of dollars diverting rivers, occasionally pumping them over a water basin or continental divide to create a cultivated place where it otherwise could not flourish. Let us look a bit more closely, although still briefly, at five cases of the technologizing of water and waterways within the context of the broader landscape in order to illustrate some of the aesthetic issues related to what may be termed "watercraft" and subsequently to draw a few more general conclusions about the subject.

Niagara Falls is one instance of the conflux or even conflation of watercourse, land mass and "technoscape"—having once been redesigned, completely de-watered (stopped) and engineered by architects so that the river flow, direction, erosion, and scenic views could be regulated by humans. As Anne Spirn succinctly puts it, "Niagara Falls is shaped by water flowing, rocks falling, and trees growing, by artists and tourists, by journalists and landscape architects, by engineers and works who divert the water." As both a technological construction and an other-than-human phenomenon, it is a product and ongoing process not just of the law of gravity but of "paintings and postcards, memory and myth."[13] Understandably, there exist differing views of the Falls in terms of whether it should be an historical monument, a grand spectacle or a recurring event. The conflict and tension between perceptions of Niagara Falls as a scenic landmark and source of power also mirrors in many respects a split within the American conservation movement that goes back to the battles between conservationists such as Gifford Pinchot and preservationists like John Muir. And the

discussion of how to restore the vanished beauty of the waterscape has involved a wide range of commercial, hydrological and especially aesthetic issues, including water use, tourism, and technical patterns of flow and erosion.

In his provocative but problematic book, *Hand's End: Technology and the Limits of Nature*, David Rothenberg illustrates the complexity of the relationship between technology and nature through his encounter with Niagara Falls. Donning plastic raingear, he descends via an elevator into the human-made tunnels beneath the Falls in order to experience the full force of the hidden technology and the seemingly raw power of the roaring water. Reflecting upon his gaze into the magnificent abyss of cascading water from within the landmark, Rothenberg writes, "It does not look like water, or even feel like water. Most present is the tremendous rumble, a roar of flowing Earth. This precedes all other perception." His observations continue:

> It is nature, not art, which is apprehended through the white fury at the end of the soaked shaft. But it is only the artificial pathway, cut and blast into the core of the rock, which makes this experience possible. A violent, rough course of dynamite and explosions made this route into the heart of Niagara. Once inside, we are able to perceive an unceasing force beyond our power to create . . . It is does not seem to matter that the entire flow of the water is regulated and controlled.[14]

Rothenberg confesses that whenever he now sees water he thinks of it differently, having been brought "closer to nature" through technology; however, he does not indicate clearly if this new proximity is epistemological or physical, or both. One also wonders whether it might in fact matter at times that we have this cognitive awareness, for it likely does at least complicate our aesthetic judgments knowing that the fluid is monitored and adjusted like an "organic machine" or a municipal water system. In the same way, it can make an important aesthetic or ethical difference knowing that a tree is plastic (rather than biological), that a forest has been replanted (rather than flourishing as old growth), or that a flower is an exotic newcomer to an ecosystem (rather than native to the place).[15] Nevertheless, the story does underscore a significant way that the meanings of water are crafted or dramatically altered by the given technologies in operation.[16]

Frank Lloyd Wright's most famous legacy, "Fallingwater," is a second example of the intersection and merging of the built world of artifacts and human technology with the ostensibly natural world of water. Built in western Pennsylvania, the house is cantilevered dramatically over the waters of Bear Run. Sewn into a wooded setting, it is tethered to a waterfall and anchored aesthetically and structurally with the rock ledges below. Here beauty is found at the confluence of stone and water—building and stream—where we see the congress of stability and habitability of the architecture on the one hand with the flux of the moving fluid on the other hand. At "Fallingwater," we witness the captured moment and continuous momentum of domestication in which the meaning of the stream is suddenly and spectacularly defined in its marriage to Wright's home. Water not only rushes around and under the structure—as the other-than-human realm fills the dwelling unit with the sounds of the stream and visually registers its movements through expansive glass panels—but via steps unfolding from inside the living room and the hold of the house—one is able to descend to and into the bubbling brook.[17]

My third example is drawn from Martin Heidegger's phenomenological description of a

hydroelectric plant placed into the waters of the Rhine River, a subject he discusses in his essay, "The Question Concerning Technology." In Heidegger's treatment of modern technology, the hydroelectric plant transforms the river into a mere supply of waterpower. The Rhine no longer is a river in the landscape except as "an object on call for inspection by a tour group ordered there by the vacation industry."[18] And this in the end is a kind of "monstrousness" that he finds intolerable. To the extent that this technology reveals the water, it is as "unlocking, storing, distributing, and switching." "Everything," Heidegger argues, "is ordered to stand by, to be immediately at hand" such that the natural world and the river in particular become "standing reserve" (*Bestand*) to be exploited.[19] At operation here in his focus upon technology by way of its relation to water is a sharp contrast that Heidegger develops more fully in other works between *poesis* (poetic making) and *Gestell* ("enframing") such that the former is typically given privilege over the latter. That is, the artwork and the aesthetic are set over and prioritized above the "waterwork" and the technological. By way of contrast, Heidegger extols a wooden bridge and elsewhere celebrates a stone bridge that spans a stream as positive examples of human artifacts because they unite the water with the earth and sky while respecting their individual differences and elemental natures.[20] In both instances, the meaning of water is ultimately determined by and through the kinds of construction built over or in it, including the aesthetic dimensions of the particular technological materials and processes employed.

Fountains are a fourth aesthetic mode of water domestication. Through a technological infrastructure, water is pumped, piped and lastly plumed into the public sphere to be revealed artfully in terms of an orchestration and display of power, beauty or property. Ivan lllich remarks upon this phenomenon in one cultural context:

> Rome's glory was the ostentatious domestication of Mnemosyne [the muse of memory] both through the codification of public memories in Roman law and through the piping of city water. Roman architects picked up a source in the mountains, channeled the water unmingled into the city, and chose for each one of the waters the stories it should tell in the city . . . The artist used the water to give sparkle to the titrons and nymphs of his invention, and the Senate chose the street crossing to exhibit its power over that water flow.[21]

Other societies, of course, have displayed piped water, but they have not generally put it to use for the same amalgam of aesthetic and political purposes as ancient Rome, even if the waters have been invested routinely with signs of power. In the United States, for example, the fountains we find in arid environments and specifically in desert locales like Las Vegas are more likely to deploy water to enact ostentatious displays of affluence and excess, flaunting the precious fluid as a sign of over-the-top expenditure.

A fifth and final instance of landscape aesthetics involving water technologies is located in Denmark. In this country, a staggering ninety percent of rivers and streams have been straightened or "de-meandered" through technological processes. This practice, which also occurs in other parts on the world, is driven by the need to drain fields and to deliver water or remove waste as efficiently and inexpensively as possible.[22] In recent years, though, there have been repeated public calls for "re-meandering" waterways from the Danish Skjern River to the Los Angeles River. Such cases seem to suggest the difficulties of clearly separating the physical, cultural and technological

realms when we interact with, transform or restore ecological processes. Why, we might ask, do so many of us share affinities with or nostalgia for meandering water? The un-straightening of the Skjern, which was de-meandered three decades ago, is apparently being sought by Scandinavians for a number of overlapping reasons, including as a benefit to animals; for the sake of water purity; and in the name of "nature." As one commentator has also argued, it is necessary in the process to protect surrounding agricultural systems that enable a stream or river to meander, and these need to be continually maintained and managed by human communities. Beneath all this discussion, however, the most compelling force at work may be that most humans simply prefer the aesthetic appearance of a wandering river or a wiggling stream to a linear flow. There may in fact be something within our learned or acquired perceptual sensibilities that loves the fluid, serpentine or meandering movement of fluids, perhaps originating with a form of "biophilia" that emerged from our evolutionary past as we humans have lived near flowing waters over many millennia.[23] Nature, it seems, may "abhor" a straight line—in addition to a vacuum, as Aristotle once observed—if we may speak a bit anthropomorphically for a moment.[24]

What can we conclude from these examples? First, many different forms of the art of watercraft emerge as we engage in a domestic "dialogue" and cultural "conversation" with the fluid. Water continually shapes and sculpts our sense of place through the force of its flows, and we respond in turn by channeling, corralling, or containing it in turbines, pipes and trenches. Secondly, aesthetic issues are central factors in most hydrological projects even when they are not distinctly articulated as such. Like other values—ethical, political and religious—they work in powerfully conscious and unconscious ways, such that beauty can even rival, complement or complete a sense of ethical duty when individuals seek to protect a particular ecosystem or environment. Thirdly, engineering marvels and feats involving water such as Niagara Falls, Hoover Dam, the Golden Gate Bridge, and the Three Gorges Dam in China testify to the appearance of a "technological sublime" which either coexists or competes with the conception of a natural sublime as well as more traditional notions of beauty in constructions that astound and awe our aesthetic sensibilities. Nye notes accurately that "great works of architecture and engineering, like mountains, vast waterfalls, and canyons" are often able to "leave a visitor dumbfounded, amazed, and deeply impressed either by natural forces or by human's ingenuity in overcoming them."[25] As he speculates, this was likely the case when, for example, ancient writers celebrated aqueducts and other large engineered structures in similar language.

Finally, we need to remain attentive to what is concealed or revealed in the use of water for aesthetic purposes and other goals. Simple appeals to purity and being "closer to nature" are not necessarily helpful, and they can in fact be obfuscating or dangerous. Langdon Winner seems to recognize this point in his work, *The Whale and Reactor*, when he expresses skepticism toward the concept of nature as a criterion for technological critique. However, in the closing chapter of an otherwise consistent and insightful book, Winner almost quietly valorizes or privileges the abstract concept of nature himself via a representative and embodiment of the biological world in a large gray whale who emerges from the ocean to meet and symbolically confront the Diablo Canyon nuclear reactor that Winner seeks to challenge. As a kind of elemental force and seemingly unassailable ambassador of the watery depths who leaves him in an "overpowering silence," the whale suggests to us that it is ever-tempting to invoke nature as a singular norm or unquestioned standard for assessing hydrological (and other) technologies, even when this approach may not be warranted because of the complex, multiple and contested meanings of the term.[26]

## IV. Organic Machines: From Waterways to Waterworks.

"We took a pristine river and we turned it into a working river—a machine. It is damn fine machine," proclaims Al Wright of the Pacific Northwest Utilities Conference Committee.[27] In this remark and the processes associated with the Columbia River in the northwestern U.S. and southwestern Canada, we can observe the protracted transformation and taming of a wild waterway into a technological water-work. We can also witness how human labor and knowledge of the physical world are deeply intertwined so that the result is what historian Richard White styles an "organic machine."[28] Through an extended cultural and historical analysis, White has shown that the Columbia River is a system of energy that retains its other-than-human qualities even as it is greatly modified by human actions. He argues that nature is both a cultural notion and a set of forces exterior to us—one not completely contained by cultural constructions—and that it also must be placed into the context of history. "Nature," he writes, "is salmon swimming, the river flowing, and, I would add, humans fishing."[29]

White investigates the relationship between human history and natural history and in the process the connections between the technological and nonhuman worlds. He reveals how work—which he does not distinguish from labor[30]—and our technological artifacts link us "for better or worse" to the natural environment. In particular, White explores a seeming "piece of ghost technology" in the river dams along with salmon, who navigate the river as an emissary and emblem of the physical world. Making a case for impurity and the blurring of boundaries and borders, he suggests that we should seek the "natural" in dams and see the "unnatural" in salmon, although he still appears to subscribe to a fairly traditional notion of nature in his analysis. Along the way, White uncovers a close relation between the work, energy and action of the river and that of humans.[31] In the case of the Columbia River, and by extrapolation other water systems, local people acquire knowledge of a river through the work of trading, transportation, dam building, and fishing. "Dams, hatcheries, channels, pumps, cities, and ranches are all products of human work, and it is our labor that ultimately links us to the river. Our labor, our energy, is the nature in us. And we harness it, just as we harness nature, to social purposes." In White's view, normative calls for a "return to nature" would amount to "posturing" and be akin to a "religious ritual and a pledge to sin no more promises to restore purity."[32]

In brief, White illustrates how technology has long been applied to a river with canoes, dipping nets, and sailing vessels. In more recent historical periods, machines such as steamships, mills, and hydroelectric power have increasingly mediated our relationship to the water. For the gillnetters who labored on the river, their work often "naturalized" them in both senses of the term. "To watch gillnetters at work was to witness an elaborately choreographed dance of fish, river, and men. The habits of fish, the hydraulics of the river, and the organized labor of men all intersected. Labor and nature merged. No element, no movement could be separated from the other; each, to some degree shaped the other."[33] Irrigation farmers, too, removed water from the river but also in turn established control of waterways, building as well "artificial" streams to hold what they took from the river. Dams now rely on the flow of the Columbia to move turbines; however the building of reservoirs in turn effects the movement of the river itself, making still water from flowing fluids and deep water from shallow water. The organic and the mechanical, in short, are completely melded and merged, as technology critic Lewis Mumford had hoped when he spoke optimistically—

and perhaps a bit naively—of hydroelectricity as the freeing of both nature and human labor and envisioned a Neolithic world of organic machines and ecological harmony.[34]

It is significant that White characterizes the river as an "organic machine" and not just a machine per se (as in the remark above by the utility spokesperson). "The Columbia," he asserts, "has become an organic machine which human beings *marriage* without fully understanding what they have created. The organic machine has, in turn, spawned a virtual river whose life influences the actual Columbia."[35] White is right to point out that machines can be physically *disassembled* and moved from location to location, unlike the river, which has been *conceptually* taken apart. Interestingly, such an approach to technology is similar to Langdon Winner's suggestive notion of "epistemological luddism," which advocates an active dissection or dismantling of new technologies —either physically or figuratively—in order to better understand their possible impacts, workings and effects.[36] By viewing the Columbia as a machine, the river has been transformed into separate spheres, functions and parts. "Fishermen see habitat. Irrigators see water. Power managers, utility operators, and those who run aluminum factories see reservoirs necessary to turn turbines. Barge owners see channels with certain depths of water. Environmentalists see brief stretches of free-flowing water. All stake a social claim to their part of the machine. None of them are concerned with the river as a whole."[37] This division does not in the end work, however, because the river is still linked to greater organic cycles outside of human control. The river, in other words, has its own life and purposes. It is, according to White, forever changing, mocking our attempts to reign it in. The complex and unanswered question arises if it can be viewed and treated once again as a whole, or whether this is a fiction and impossibility. Can we put Humpty Dumpty back together again—perceive it as an integrated whole? This might be asking for too much. White's diagnosis reveals our failed relationship with water and the surrounding environment. He asserts that we have neither killed nor raped the river, pointing out correctly that these metaphors are inadequate. It is more like a *failed marriage*—an analogy that "for better or worse" (as we say in these domestic agreements) underscores the notion and role of domestication in our interactions with water and the elements. In White's perspective, we have gone far past the commodification of the river because it is now partly a human creation where the physical locale of the waterway—or water-work as it were—has been dramatically rearranged.[38]

In the last analysis, White's exploration and theory invites a less contemplative and more active (but still relatively respectful) connection with the physical environment, one that I am terming "domestication." Here we see a potential bridge to the work of environmental philosophers and technology critics who stress the notion of labor and work in understanding our ever-changing relations to our surroundings.[39] From this vantage point, activities ranging from fishing and gardening to building and sailing help us to grasp the ambient elements and elemental nature when we actively engage them.[40] Put briefly, the human hand—and its prosthetic extension in the fire of technology—is involved deeply in the mediation and transformation of water as we mix our bodily labor with the world around us.

## V. The Domestication of Water: Toward Techno-nature?

What is meant more particularly by the domestication of water? We can identify a number of key conceptual points as part of an attempt to more fully address this issue. First, water passes through

the house and home, the human *domus*, where it is domesticated technologically in pipes and plumbing, bottles and baths, drains and dehumidifiers, showers and sinks, refrigeration and radiators. In this sense, it is brought "outside-in," its meanings—along with its volume and form—defined and demarcated in the process. Secondly, water is generally filtered and mediated rather than perceived or experienced in a "pure" unencumbered or unadulterated encounter. Such mediation occurs practically and technologically but it can also take place epistemologically and linguistically, as in the many names we fashion for the phenomenal forms of water— rain, sleet, snow, ice, hail, aquifer, ocean, lake, stream and so forth—or give to kinds of drinking water (see next section).

Thirdly, the notion of domestication provides a more coherent theoretical and explanatory environmental model for our interactions with water (and other environmental "elements") than the prevailing notion of "the domination of nature," which has been advanced by Frankfurt School theorists and in other environmental discourse. As Hegel puts it in one framework, "Nature itself, as it is in its universality, cannot be mastered."[41] Water in particular is not dominated or, alternatively, liberated into a pure immediacy. Its course might be modified, channeled or redirected. Its containers might be opened, enlarged or reconfigured. But it is not oppressed, exploited or emancipated in the manner of human persons. And there are bidirectional and bivalent influences at work as well; water impacts us significantly even as we seek to domesticate it. We impose values upon the fluid or read norms off of it—purity, cleanliness, rebirth (as in baptism), wholeness, and the like—in part because it seems to serve as a receptive liquid screen and colorless fluid upon which we project wishes that are often more stable and starkly colored. At the same time, water also carries and conducts values to us, as for example in the language we use and associate with it—currents, flows, floods, streams of consciousness, and so forth. And yet there are constraints in and limits to this process, for water also seeks its own earthward or air-bound courses, follows paths of its own tendencies, and disappears or descends in unexpected ways and at surprising times.

Here a rough analogy exists with the domestication of nonhuman animals because some creatures—such as dogs or commensal mice—appear to choose our domestic worlds as much as we select them. Domestication may share an etymological root with domination (meaning control), but it is also cognate with *domus* (house or home), thus rendering something very particular—in this case water—known and relatively familiar on an everyday basis. Given these dual dimensions, domestication is thereby often an ambiguous process and ambivalent prospect. However, because it concerns distinct entities (e.g., animals, water, earth or fire) it is a decidedly less abstract practice and idea than either the so-called domination or even domestication of "nature." Typically, since domestication concerns walls (as in those of a well, house or barn), it also raises relevant philosophical and political questions about inclusion and exclusion, insides and outsides.

Fourthly, the concept of domestication allows us potentially to take into critical account the role of gender dynamics as we assess technological issues and human relations with the natural world.[42] Water has commonly been conceived in feminine terms—typecast so to speak as receptive, fluid and passive, even if powerfully so. This view is evident in the philosophy of Taoism, for example, where we find the idea that "nothing in the world/is as soft and yielding as water/Yet for dissolving the hard and inflexible,/nothing can surpass it."[43] Women, in turn, have often been associated closely with earthly processes, including the flows of various fluids.[44] The familial household—the

primary seat of domestication—moreover has been assigned as the traditional sphere of women in most cultures. As could be expected, the task falls to women and girls in many societies to cook, clean and care for children, domestic concerns that involve ongoing water use. In the developing world, too, while men might typically dig and build wells, women are regularly consigned to carry water long distances back home.[45]

One final instance of the link between gender, water and domestication occurs in the late nineteenth century when female nudity was connected as a cultural symbol to tap water in the bathroom. As Ivan Illich has shown, "the proximity of the suds and nude in the bath domesticated both water and flesh. Water became that stuff that circulates through indoor plumbing, and the nude became the symbol of a new fantasy of sexual intimacy defined by the newly created domestic sphere."[46] This point is evident in the paintings from the time in which the image of woman was joined with that of urban water in bathing instead of presenting her in more religious and mythological settings. As examples, we find Ingres' Turkish bath scenes or Degas' tubs and basins that he used to present his subjects. In a domestic setting, the natural beauty of the water is secured—and distanced from being viewed as "recycled toilet flush"—while the cultivated beauty of the woman is underscored and heightened. In multiple and varied ways, then, water is channeled into the domestic sphere, where it assumes new and ever-changing relations with a populace that has through habit come to project a wealth of meanings onto the elemental medium.

**VI. Bottled Water: Purification as Mediation.**

One of the newest "necessities" or, alternatively, latest fashions, fads and perhaps even fetishes is bottled water—our last subject in this study. In this widely expanding phenomenon and practice, water is domesticated minimally in the sense that it is captured from the hydrological and meteorological cycles—its flow arrested—before it is contained, "purified," and finally refrigerated or consumed in the human household—the encompassing site of domestication. In the process, water is to one degree or another altered, its meaning changed as our connection with it is mediated and the essential substance of life is marketed and sold like other products. In the last decade, the per capita consumption of bottled water has more than doubled in the United States, and more than half of all Americans now drink it. In 2002, U.S. consumers spent more than seven billion dollars on the fluid, and in 1997 we drank about twelve gallons per person of the product.[47]

Bottled water has also acquired a high-tech appeal in the financial world as investors are rapidly buying up land for purposes of filtering, processing and transporting the fluid. Corporations such as Coca-Cola, Pepsi, Chlorox Bleach and Bechtel are currently joining the international rush to privatize and commodify water through political battles, pipelines and bottling technology, developments that seem to confirm the idea that "water flows uphill towards money."[48] At approximately $4.50 to $7.00 per gallon, bottled water is now more costly than soda, milk, oil and gas, and about 500 to 1,000 times more expensive than tap water. Coca-Cola has encouraged and capitalized on these trends with a campaign against offering tap water in restaurants designed to promote Dasani, its entrant into the bottled water wars.[49] There are even bottled "water bars" emerging in some major cities, while many restaurants and stores regularly display water bottles from Europe as if they were filled with wine. The use of polyethylene terephthalate (PET) and associated technological developments clearly have been integral in facilitating these commercial and social changes given that PET is transparent, light and flexible, thus permitting portability and

disposability.

In terms of the geological and technological filtering processes, about seventy-five percent of U.S. tap water historically has come from the surface water of streams, lakes and rivers, and these sources have been vulnerable to different forms of contamination. By contrast, ground water is relatively free of pathogens if it journeys through clean paths. In Italy and France—the leading exporters—all bottled water derives from underground origins. Filtering occurs via the layers of rock and sand through which rain and melting snow transit, thereby "purifying" the water of microbial and chemical elements that might threaten its integrity for drinking. In the process, it acquires a "fingerprint" or defining signature—a tattooed mark so to speak of its mediation—through the mineral traces that give it character and taste, and it can remain in route for several years in the earth before finally being bottled. The European Community sets standards for mineral water, so that it must be free of particular microbiological and chemical components; bottled at the source; and unfiltered or treated in any significant technological manner.[50]

By contrast, American "spring water" is required to begin underground and move of its own accord to the surface, though bottlers can add carbon dioxide to it. "Mineral water" is defined similarly, but it must also possess a specified but relatively small level of dissolved minerals. And "purified drinking water" is bottled water treated by a technical process (deionization, reverse osmosis or distillation), though companies do not need to name the water source, which can even be municipal tap water. In the U.S., spring water is often used as an interchangeable term with "artesian water"—from wells where the pressure is high enough to push water to the surface. In short, we can observe an extensive taxonomy and nomenclature emerging with the proliferation of technologically processed and purified bottled water that suggests the fluid is not an objective or singular thing-in-itself, but a physically and culturally mediated product—a conceptually contested substance with a plurality of forms and social associations involving status, health, safety, and a desire for the pristine.

In Europe, moreover, mineral water is widely considered "a living thing" and access to this "living water" is a guaranteed right in some countries. In Italy, the government leases privileges to firms to bottle water and requires them to supply taps where all citizens can fill their own bottles. In both Italy and France, bottlers in fact must show that the water has health-promoting qualities before it can be sold as mineral water. In an age of terrorism and geographical transience, Americans increasingly appear more concerned with safety and portability than with taste such that it is common to see a guarantee of "purity" on container labels. Despite such fears, which seem to drive much consumption, a study by the National Resources Defense Council has shown that bottled water is no safer than ordinary tap water and that weak or byzantine governmental regulations can even make it an inferior product.[51]

Is, then, bottled water natural, technological or some of kind of hybrid entity? Put differently, is "denatured water" thus artificial or "technological water" still natural? The lines between these distinctions and realms have indeed become murky and "impure." Some bottlers currently purify tap water and then add (we could say adulterate it with) calcium, bicarbonates and magnesium for flavor—making it a kind of technological "designer water." One can now even find caffeinated, vitamin-enriched and strawberry or lemon-flavored brands being sold. Most experts who work with mineral water seem to believe, however, that particular kinds of water cannot be duplicated in a

laboratory, and that a missing key ingredient may be the occurrence of microflora, which isfound in the biological world. In the purification process, therefore, it is not even completely clear what we are necessarily losing or gaining with filtration. As one might expect, the Food and Drug Administration (FDA) in the U.S. does not help much with these questions since it does not provide exact definitions of the terms in question. A great deal of American bottled water is little other than treated tap water sold as "drinking water," which the FDA has also not clearly defined. A business simply needs to treat the water according to a given technological standard of purity, such as reverse-osmosis or de-ionization, which strips it of characteristics that identify it. This process, in other words, eliminates the water's "fingerprint," excising its taste. However, when water from different springs is sold under the same brand name, we are not given either a unique character and taste or a sense of its place and point of origin—important ecological and consumer considerations to be sure.

Both water purification and water pollution are physical phenomena—capable of measurement, testing and technological treatment—but they are also philosophical problems since they necessitate an inquiry into matters related to ideals or degrees of cleanliness, contamination, and adulteration—notions that are deeply tied with their conceptual opposites. The filtration of water is manifestly an expensive process, and it is often the most viable way to get rid of cryptosporidium, giarida and other pathogens not treatable by chlorine. Many inexpensive home-filtration systems can eliminate chlorine and lead while slightly more expensive filters are able to remove pathogens, thus providing a practical alternative to bottled water. It is important to keep in mind that the chemistry of groundwater is actually and increasingly being altered by anthropogenic pollution. In recent years, dissolved "additives" have risen by ten percent and by as much as one-third in terms of sodium, chlorine, salt and sulfate. Leachates from herbicides, pesticides, fertilizer, radioactive traces, and toxic chemicals have been discovered throughout the water world, and the problem is exacerbated in the U.S. due to the flourishing chemical industry.[52] Bottled water, however, itself poses a great penalty and huge ecological footprint on the environment due to the million and a half tons of plastic used each year to make containers which are often disposed of in non-renewable ways (requiring up to a thousand years to biodegrade); the carbon emissions released in the transportation of twenty-two million tons of the liquid each year from one country to another; and the increased demand placed on local aquifers that are often already over-taxed. The ironic result is that the security of common water resources can be greatly compromised precisely because many people are seeking the supposed safety of bottled water.

We clearly need practical, innovative and just water policies and practices, whichever of the three main hydrological choices we select: (i) producing more drinkable water through desalination technologies such as reverse osmosis and distillation; (ii) consuming smaller amounts via conservation measures such as new pricing systems, better management, wastewater reuse and technological developments in agriculture, industry and residential buildings[53]; or (iii) using roughly the same supply but with a smaller world population.[54] In bottling water through technological processes we are, it appears, redoubling water's endemic (i.e. "natural") ambiguities, anomalies and paradoxes. Water is necessary to life but not necessarily alive, seemingly shapeless but able to take the shape of other things, absent an innate rhythm but able to serve as a source of rhythm for the body, tides, weather, and seasons. Through its domestication, a great deal of water is now a kind of hybrid product—both natural and technological, purified but still not perfectly pure. As Ivan Illich points out of water purification: "Water throughout history has been perceived as the

stuff which radiates purity: $H_2O$ is the new stuff, on whose purification human survival now depends." He adds: "The transformation of $H_2O$ into a cleaning fluid was complete. In the imagination of the twentieth century, water lost both its power to communicate by touch its deep-seated purity and its mystical power to wash off spiritual blemish."[55] Even if this remark overstates the case, it is certain our bottle-toting citizenry no longer interact with or conceive of water in quite the same way as past generations.

**VII. Conclusion: Fire and Water.**

Illich ends his book, *$H_2O$ and the Waters of Forgetfulness*, with the stark assertion that "$H_2O$ is a social creation of modern times, a resource that is scarce and that calls for technical management. It is an observed fluid that has lost the ability to mirror the water of dreams. The city child has no opportunities to come in touch with living water."[56] Michael Oakeshott echoes this opposition of water and $H_2O$ when he holds that "the word 'water' stands for practical image; but a scientist does not first perceive 'water' and then resolve it into $H_2O$: *scientia* begins only when 'water' has been left behind." He adds, "To speak of $H_2O$ as 'the chemical formula for water' is to speak in a confused manner: $H_2O$ is a symbol the rules of whose behavior are wholly different from those which govern the symbol 'water.'"[57] In such claims, we find the perception and concern that the power of water has been diluted, so to speak, by the omnipresence and force of modern technology and that, in a sense, it has been cleaved into two separate substances—a primordial or archetypal fluid and a technological or commercial chemical.

There are clearly both ecological and political reasons to be worried about the state of water in the world. It is, in other words, not simply a technological issue, although there are without question emerging technologies that can better assist us with matters related to distribution, filtering and sanitation. The amount of water on the planet is finite, and the demand for fresh water is growing. We cannot make more even if we can desalinate salt water, often at great expense. We must learn to perceive water in both environmental and cultural terms. We need to use less, conserve more, and to address population issues if we continue to use the same amount. Global problems necessitate both upstream and downstream aqueous solutions—more equitable uses in the former instance and more judicious development of water resources in the latter case. With more than a billion people having no access to clean drinking water and nearly three billion without access to sanitation services, the widely recognized water expert Peter Gleick argues accurately that the expense of failing to provide water for sanitation and drinking will far exceed the cost of doing so in terms of health care and social welfare. He in fact recommends that UNESCO adopt a human entitlement of 50 liters of water per person per day—which amounts to about 5 liters of drinking water, 20 for sanitation, 15 for bathing, 10 for cooking food—a figure still greatly below the minimal average withdrawals per capita in most countries poor in water resources. And because water is social good—a prerequisite for all rights we might say—Gleick advances the idea that we establish a "universal 'lifeline rate" for water consumption.[58]

Today, a vast volume of water, too, is unable to to purge itself of industrial pollutants. As Alice Outwater points out, "By dredging, by damming, by channeling, by tampering with (and in some cases eliminating) the ecological niches where water cleans itself, we have simplified the pathways that water takes through the American landscape; and we have ended up with dirty water."[59] At the

same time, if pollution like domestication is philosophically a kind of "inside-out" problem—in that we are not respecting what is perceived to be outside the scope of a particular conception of one's home or place—then in domesticating water, we are provided with the opportunity not just of bringing it to our bodies (via pipes and bottles) or onto our agricultural fields (via irrigation) but also of keeping it actively in mind as it enters the human household.

To sum up, I have tried to show how water is increasingly domesticated and mediated by technological developments and how this elemental substance is revealed, concealed or changed in significance by this process. We have looked at cases from philosophy (Thales), commerce (bottled water), landscape technologies and aesthetics (e.g., Niagara Falls and de-meandered rivers), and human labor (the Columbia River). We have also explored what I have identified as water domestication. Like the liquid itself, the meanings of water are ever-evolving as the forms of technical mediation are altered. It surely behooves us to remain attuned to the kinds of actual and theoretical filtering that occur with complex or hidden technologies because the possibility perpetually exists for a kind "reverse adaptation" to set in, whereby desirable social ends and goals (e.g., clean drinking water) are adjusted and reformulated to meet the available technical means chosen (e.g., water in plastic bottles) so we are left with a diminished result, a mal-distributed resource, or an unintended consequence.[60] When the "fire" of technology meets the "watery" flux of nature, we often find ourselves situated in—or moving between—earth's given waterways and more human-generated waterworks. And if it is true as Illich holds that "the twentieth century has transmogrified water into a fluid with which archetypal waters cannot be mixed,"[61] then we must certainly seek to better understand these cultural and technological fluid dynamics in order to best meet our social, ecological and bodily needs. Even if we succeed in doing that, D. H. Lawrence may still retain the last word on the subject when he notes that "water is . . . hydrogen two parts, oxygen one, but there is also a third thing, that makes it water and nobody knows what it is."[62]

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## Notes

1. "Constrained constructivism" is an expression N. Katherine Hayles uses to point to an interrelationship between representation and restraint, arguing for the abandonment of an independent god's-eye-view of the natural environment and promising encounters with a world "more capacious than our views alone can imagine." See Hayles, "Searching for Common Ground" in Michael Soule and Gary Lease, eds., *Reinventing Nature?* (Washington, DC: Island Press, 1995).

2. Friedrich Nietzsche, *Philosophy in the Tragic Age of the Greeks*, trans. Marianne Cowan (Chicago: Gateway, 1962), p. 39. According to Nietzsche, it is only the third reason that makes Thales the first Greek philosopher because in doing so he goes beyond empirical and scientific observation.

3. For an article that is skeptical of Thales' claims and ideas, see D. R. Dicks, "Thales," *Classical Quarterly*, no. 9 (1959), pp. 294-309.

4. See Herodotus, *Histories*, Bk. 1:75 in M. I. Finley, ed., *The Portable Greek Historians* (New

York: Penguin Books, 1958).

5. The problem persists of how to "categorize" and characterize the life and writings of the Presocratic Empedocles as well. He, too, was likely involved in a direct manner with practical problems and applications of his knowledge about the classical elements—earth, fire, air and water—that he first thematized. See David Macauley, "Greening Presocratic Philosophy: The Flowering of Environmental Roots and the Four Elements in Empedocles," manuscript submitted to the journal *Worldviews: Environment, Culture, Religion*, August 2004.

6. Mott T. Greene, *Natural Knowledge in Preclassical Antiquity* (Baltimore, MD: Johns Hopkins University Press, 1992), p. 100.

7. Greene, *Natural Knowledge*, op. cit, p. 105. Perhaps, then, we also need to begin to dispense with the hallowed image of the philosopher in his or her study divorced from the natural world and also the realm of practical and technological affairs.

8. We take the word "meandering" from the Meander River, which Ovid celebrated. The serpentine, ribbon-like curves that mark such water flows make it amenable to the kind of engineering project that Thales may have undertaken. Although it was a different river, the Halys does meander substantially, following a sinuous course rather than a straight line. See Greene, op. cit.

9. See D. J. Furley, "Empedocles and the Clepsydra," *Journal of Hellenic Studies* 7 (1957), pp. 31-34.

10. Karl Wittfogel, *Oriental Despotism: A Comparative Study of Total Power* (New Haven: Yale University Press, 1957). On Wittfogel's place within critical theory, see Martin Jay, *The Dialectical Imagination* (Boston: Little, Brown and Company, 1973). For an application of Wittfogel's analysis to the Colorado River, see Donald Worster, "Water and the Flow of Power," *The Ecologist* 13 (1983), pp. 168-74.

11. John B. Jackson, quoted in David Nye, ed., *Technologies of Landscape* (Amherst, MA: University of Massachusetts Press, 2000).

12. Simon Schama, quoted in David Nye, ed., *Technologies of Landscape*, op. cit., p. 4. It is more accurate, I think, to see the relation between land (earth) and culture (world) as interactive and dialectical rather than to posit a "before" and "after" in an ongoing process.

13. Anne Spirin, "Constructing Nature: The Legacy of Frederick Law Olmstead" in William Cronon, ed., *Uncommon Ground* (New York: W. W. Norton, 1996), p. 98.

14. David Rothenberg, *Hand's End: Technology and the Limits of Nature* (Berkeley: University of California Press, 1993), p. 194.

15. For relevant articles on ecological restoration, see Martin Krieger, "What's Wrong with Plastic Trees?" and Robert Elliot, "Faking Nature" in Louis Pojman, *Environmental Ethics: Readings in Theory and Application* (Belmont, CA: Wadsworth, 2001), pp. 218-234.

16. Rothenberg also claims there is no great damage to environment, but it may be that we just

can't see the harm that has been inflicted, either because it is below ground or it occurred in the historical past.

17. For photographs of the house, see Lynda S. Wagonner, *Falling Water: Frank Lloyd Wright's Romance with Nature* (New York: Universe Publishing, 1996).

18. Martin Heidegger, *The Question Concerning Technology*, ed., William Lovitt (New York: Harper & Row, 1977), p. 16.

19. Ibid, pp. 16-17.

20. Martin Heidegger, *Poetry, Language, Though*, trans. Albert Hofstadter (New York: Harper and Row, 1971).

21. Ibid, pp. 37-38.

22. On the de-meandering of streams, see Kenneth R. Olwig, "Reinventing Common Nature" in Cronon, ed., *Uncommon Ground*, op. cit., pp. 404-407.

23. Biophilia is the notion that humans have an innate affiliation with the natural world and biological life in particular that has arisen through evolution, a love and affinity that can affect our aesthetic preferences. See Stephen Kellert and Edward Wilson, eds., *The Biophilia Hypothesis* (Washington, DC: Island Press, 1993).

24. There are, it appears, very few straight lines in the natural world, at least at our perceptual level. Even trees do not necessarily grow at a distinct right angles to the earth.

25. Nye, *Technologies of the Landscape*, op cit.

26. Langdon Winner, *The Whale and the Reactor* (Chicago: Univ. of Chicago Press, 1986).

27. Quoted in Blaine Harden, *A River Lost* (New York: W.W. Norton, 1997).

28. Richard White, *The Organic Machine* (New York: Hill and Wang, 1996).

29. White, *The Organic Machine*, op. cit., p. x.

30. See Hannah Arendt, *The Human Condition* (Chicago: University of Chicago Press, 1958) on the distinction between work and labor.

31. Interestingly, as White points out, just as not all human energy is fruitfully realized in successful efforts (e.g., fishing), so only two percent of the river's potential energy eventuates in work via erosion, transportation or deposition of matter; the rest is kinetic energy expressed and dissipated as friction against the bed, banks and river itself.

32. White, *The Organic Machine*, op. cit., p. 112.

33. Ibid, p. 41.

34. See Lewis Mumford, *Technics and Civilization* (New York: Harcourt, Brace and World, 1963) and *The Myth of the Machine* (New York: Harcourt, Brace and World, 1967). See also David Macauley, “Greening Philosophy and Democratizing Ecology” and Ramachandra Guha, “Lewis Mumford, the Forgotten American Environmentalist” in David Macauley, ed. *Minding Nature: The Philosophers of Ecology* (New York: Guilford Press, 1996).

35. White, *The Organic Machine*, op. cit., p. 108, italic added.

36. See Langdon Winner, *Autonomous Technology* (Cambridge, MA: MIT Press, 1977).

37. White, *The Organic Machine*, op cit., p. 110.

38. Ibid., p. 110.

39. See, for example, Steven Vogel, *Against Nature: The Concept of Nature in Critical Theory* (New York: S.U.N.Y. Press, 1996) and Michael Pollan, *Second Nature: A Gardener's Education* (New York: Delta, 1991).

40. On the elements and their relation to the environment, see David Macauley, *Bewildering Order: Earth, Air, Fire and Water* as Elemental Philosophy and Environmental Ideas (Albany, NY: State University of New York Press, forthcoming).

41. G. F. Hegel, *The Philosophy of Nature*, quoted in William Leiss, *The Domination of Nature* (Boston: Beacon Press, 1974), p. 125.

42. On issues of gender and technology, see Patrick D. Hopkins, ed., *Sex/Machine* (Bloomington, IN: Indiana University Press, 1999).

43. See *Tao Te Ching*, trans. Stephen Mitchell (New York: HarperCollins, 1988), chap. 78.

44. The literature on ecological feminism is relevant in this regard. See, for example, Carolyn Merchant, *The Death of Nature* (New York: Harper & Row, 1979).

45. Domestic marriage metaphors are also commonly used with water. As we saw in the case of the Columbia River, Richard White describes our relation with the moving water as a “failed marriage”. In the ancient Greek theories of the elements, the Presocratics often used the language of domestication in characterizing the wedding of earth and sky, or marriage of waters and heavens.

46. Illich, *$H_2O$ and the Waters of Forgetfulness* (Dallas: Dallas Institute of Humanities and Culture), p. 1.

47. Julie Stauffer, *The Water You Drink* (Gabriola Island, BC, Canada: New Society Publishers, 2004), pp. 93-99.

48. See Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water* (New York: Penguin, 1986). On recent efforts to privatize water resources in places like Stockton, California, India and Bolivia, along with community resistance movements, see the documentary, “Thirst,” which appeared on WHYY, channel 12 in Philadelphia, July 18, 2004.

49. "'Just say No to $H_2O$,'" *The New York Times*, September 2, 2001.

50. For this section, I have benefited greatly from Corby Kummer's informative article, "Carried Away," *New York Times Magazine*, August 30, 1998, pp. 38-61.

51. Interestingly, bottled water is legally considered a food product. Brian Howard, "What's in your Bottled Water?," August 28, 2003, reprinted from E: *The Environmental Magazine* at http://www.hartfordadvocate.com.

52. These challenges call to mind analogous problems: the fact that greenhouse gases have literally changed the chemical content of the air and atmosphere—as measured by samples taken on mountaintops and from frozen ice cores—and that according to Jacques Ellul technological processes have actually altered the chemical structure of bread, the staff of life in many countries. See Bill McKibben, *The End of Nature* (New York: Anchor Books, 1989) and Jacques Ellul, *The Technological Society* (New York: Vintage Books, 1967).

53. For a range of practical suggestions on efficient water technologies from irrigation and landscaping to toilets and washing machines, see Paul Hawkin, Amory Lovins and L. Hunter Lovins, *Natural Capitalism* (Boston: Little Brown and Co., 1999), pp. 213-233.

54. See Marq De Villiers, *Water*, op. cit., pp. 276-313.

55. Ivan Illich, *$H_2O$ and the Waters of Forgetfulness*, op. cit., pp. 75-76.

56. Ibid, p. 76.

57. Michael Oakeshott, quoted in Neil Evernden, *The Social Creation of Nature* (Baltimore: Johns Hopkins University Press, 1992), p. 159.

58. See P. H. Gleick, *The World's Water* (Washington, DC: Island Press, 2004) and Marq de Villiers, *Water: The Fate of Our Most Precious Resource* (New York: Mariner Books, 2001).

59. Alice Outwater, *Water: A Natural History* (New York: Basic Books, 1997).

60. On "reverse adaptation," see Langdon Winner, *Autonomous Technology*, op. cit. See also Edward Tenner, *Why Things Bite Back: Technology and the Revenge of Unintended Consequences* (New York: Vintage Books, 1996).

61. Illich, *$H_2O$ and the Waters of Forgetfulness*, op. cit., p. 7.

62. D. H. Lawrence, *Pansies* (1929), quoted by U. S. Environmental Protection Agency website: http://www.epa.gov/region2/library/quotes.htm.

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